

Title: A Prospective Study of Adverse Pregnancy Outcomes
Among Planned and Unplanned Pregnancies in Natural
Family Planning Users .

Running Head: Planning and pregnancy outcome

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Abstract

Objectives. To prospectively determine whether unplanned pregnancies are associated with adverse pregnancy outcomes among users of natural family planning (NFP).

Methods. Women who became pregnant while using NFP were identified in five centers worldwide: there were 373 unplanned and 367 planned pregnancies. Subjects were followed up at 16 and 32 weeks gestation and after delivery. The risks of spontaneous abortion, low birth weight and preterm birth were estimated after adjustment by logistic regression.

Results. The women with unplanned pregnancies were more likely to be at the extremes of age, to report more medical problems before and during the index pregnancy, and to seek antenatal care later in gestation than the women with planned pregnancies. However, women with planned pregnancies reported a higher rate of spontaneous abortion in prior pregnancies (28.8%) than did women with unplanned pregnancies (12.9%, $p < 0.001$). There were no

significant differences in the rates of spontaneous abortion, low birth weight or preterm birth in the two groups.

Conclusions. No increased risk of adverse pregnancy outcomes was observed among women who experienced an unplanned pregnancy during NFP use. (*Am J Public Health. 1996:00:0000-0000*).

Introduction

Pregnancy intention connotes the complex process dealing with the desire of an individual or a couple to achieve or avoid conception. Cartwright (1988) states, "Intending to do something is possibly rather less definite than planning to do so: planning may seem to imply taking action, intending more a state of mind".¹ Unintended pregnancies, as stated by the woman, could be ill-timed, mistimed or unwanted.²⁻⁴ However, as noted by David,⁵ only a minority of unintended pregnancies are truly unwanted, defined as "unintended and consciously unwanted at the time of conception".⁵ In the United States, data from the National Survey of Family Growth suggest that 57% of pregnancies and 44% of births were "unintended."^{2,4} It is estimated that 33% or more of all births in Latin America and the Caribbean are unintended or unwanted.⁶ Similar estimates are reported from New Zealand⁷ and England.¹

There are conflicting reports about the effects of unintended pregnancy on the health of infants and children. In a

prospective study of planning status and pregnancy outcome within a relatively homogeneous, indigent, and largely African American population, Goldenberg et al.⁸ found no association between maternal planning status and rates of low birth weight, preterm birth, or fetal growth retardation. On the other hand, retrospective data from the U.S. National Survey of Family Growth showed a significant association between low birth weight and unintended pregnancy, even after adjusting for potential confounders including maternal race and smoking status.⁹ Analyses of retrospective survey data suggest an association between unwanted births and increased female child mortality in developing countries where direct or indirect female infanticide is practiced,¹⁰ or where a strong preference for males exists.^{11,12}

It is hypothesized that women having unplanned pregnancies adopt poorer health behaviors and are at selectively higher risk of adverse pregnancy outcomes compared to women with planned pregnancies. This hypothesis about health care choices and behaviors derives from the observation that women seem less likely to care properly for themselves during an unplanned pregnancy.^{13,14} In addition, maternal behaviors such as smoking during pregnancy or seeking prenatal care late are associated with a higher risk for low birth weight,¹⁵ and these behaviors

may in turn be more common in women with unintended pregnancies.^{1,13-16} Alternatively, older women and those with preexisting medical conditions may actively seek to avoid conception. Clearly, such women would be at higher risk for adverse pregnancy outcomes should they experience an unplanned pregnancy. It is also possible that unintended or unwanted children are conceived when the family or the mother is under economic, social, or psychological stress.¹⁷ Thus, the child is exposed to risks as a consequence of the stressful situation surrounding its conception and birth. Children born as a result of such pregnancies may show effects of intrauterine growth retardation or prematurity, possibly related to maternal psychosocial stress during pregnancy.¹⁸

The present study is a subcomponent of an international, multicenter, prospective cohort study of women using natural family planning (NFP). The study is designed to ascertain the effects of timing of conception (as estimated by records of intercourse and NFP markers of ovulation) on pregnancy outcome.^{19,20} Natural family planning (NFP) offers a unique opportunity to study pregnancy intention and pregnancy outcomes because some women use NFP to plan a pregnancy, whereas others use NFP to avoid pregnancy. However all such women are using the same approach to determining the fertile period with comparable detailed information on the menstrual cycles preceding

conception. Furthermore, it can be ascertained prior to conception whether the pregnancy was intended (ie. NFP was being used to plan a pregnancy) or whether an unplanned pregnancy occurred despite the couple using NFP to avoid conception. The objective of the present investigation is to determine whether an association exists between planning status of a pregnancy and the risk of adverse outcomes including spontaneous abortion, low birth weight and preterm birth.

Materials and Methods

All women who became pregnant while using natural family planning (NFP) between January, 1987 and September, 1990, were identified in five NFP centers. Two centers were located in Santiago, Chile; and one each in Bogota, Colombia; Milan, Italy; and Washington, D.C., U.S.A. Informed consent was obtained using a common consent form approved by each participating institution. Volunteers were followed until delivery to estimate the frequency of spontaneous abortion, low birth weight and preterm birth. Currently pregnant women were censored at the study cut-off date in March 1991. The independent variable of interest in this analysis was the planning status of each pregnancy, and the critical comparison was the frequency of adverse pregnancy outcomes in planned versus unplanned pregnancies.

In this study pregnancy intention was ascertained from unambiguous information on the planning status confirmed from multiple data sources. When pregnancy was first recognized, information about the woman's pregnancy intention was obtained at entry into the study. The client was asked explicitly whether the pregnancy was planned. This information was validated by the NFP instructor who, after discussion with the woman and review of her NFP chart, gave an opinion as to whether NFP had, indeed, been used to plan or to avoid a pregnancy. Subsequently, independent reviewers examined the NFP chart to insure that the pattern of intercourse was consistent with the client and NFP instructor's statements about pregnancy intention. There was 99.6% agreement between the pregnancy planning intention as stated by the woman and her NFP instructor's assessment (Kappa Statistic 0.99). ²¹

The definition of a planned pregnancy was that the NFP user stated her intention was to become pregnant and the chart showed intercourse took place during the fertile period. An unplanned pregnancy was said to occur when the user stated the couple did not plan or want a pregnancy, and were using NFP for contraception. The assignment of planning status was made without knowledge of pregnancy outcome. There were 367 planned pregnancies and 373 unplanned pregnancies. Interview information was obtained at the time pregnancy was recognized (usually the

fifth week of gestation) on sociodemographic characteristics, reproductive history and the circumstances of the index pregnancy. This latter information included the method of NFP used (Ovulation, Basal Body Temperature or Symptothermal)²⁰, the dates of the last menstrual period, and such characteristics as smoking and alcohol consumption. At 16 and 32 weeks of gestation, follow-up information was obtained on prenatal care attendance, weight gain during pregnancy, complications of pregnancy, other illnesses and use of medications. Women who experienced a spontaneous abortion or other adverse pregnancy outcomes were interviewed to ascertain the date and circumstances of the event, and to exclude cases of induced abortion. Women who had births were interviewed and charts reviewed to obtain information about complications of late pregnancy, labor and delivery, birth weight, gestational age at birth and other neonatal characteristics.²⁰

We used bivariate analysis to estimate the odds ratio (OR) of spontaneous abortion, low birth weight (<2500 gram), and preterm birth (<37 weeks gestation) associated with planning status. Bivariate and stratified analysis were also used to search for potential confounders or effect modifiers. Chi-square or Fisher exact tests, and Chi-square tests for linear trend in proportions were used for statistical tests of discrete variables.^{21,22} Logistic regression was used to assess the

association of pregnancy outcome with planning status after adjustment for covariates such as maternal age and birth order (continuous variables), prior low birth weight, preterm delivery, hypertension or bleeding and smoking in the index pregnancy (as dichotomous variables), prepregnancy weight (in kg.), infant sex, and center (5 strata).²³ Assumptions underlying the models (eg. linearity of response for continuous variables) were assessed using model diagnostics (SPSS). Variables for inclusion in the model were selected on the basis of bivariate associations ($p < 0.05$) and biological relevance, and the model fit was assessed using changes in the log likelihood ratio. Statistical tests of risk ratios or odd ratios were based on the 95% confidence intervals (CI).

Results

The study enrolled 789 pregnant women in the five centers between January, 1987 and September, 1990, and follow-up of these women continued for pregnancies ended by March 1991. There were 29 (3.7%) censored observations of currently pregnant women. In addition, thirteen NFP charts (1.6%) could not be used because of missing information. There were two (0.3%) ectopic pregnancies and 5 (0.6%) multiple pregnancies which were excluded from the present analysis because the etiology of ectopic pregnancy probably differs from that of spontaneous abortion, and because multifetal pregnancies are at higher risk of spontaneous abortion and perinatal problems than singleton pregnancies. There remained a total of 740 singleton pregnancies for analysis. Among these 740 pregnancies, 77 (10.4%) ended in spontaneous abortion, 7 (1.1%) were stillbirths, and 656 (88.6%) were live births. Two neonatal deaths occurred among the live born infants within the first two weeks of life (0.3%). There were 24 (3.7%) low birth weight infants among the 656 liveborn infants, and 6 of the 7 stillbirths. Forty four (6.7%) of the live born infants were preterm births; 5 other stillborn infants were preterm births.

Table I shows the characteristics of women with planned and unplanned pregnancies. Most women were aged 25-29 years; but

there were significantly higher proportions of women in the younger and in the older age groups among unplanned pregnancies when compared to planners. Marked differences were observed in the distribution of planning status by study center; a large proportion of unplanned pregnancies occurred in the two Chilean centers, whereas planned pregnancies were more common in the other centers, particularly in Italy. A higher proportion of planners were currently employed and the difference statistically significant. There was no evidence of differentials in paternal occupation. The duration of NFP use was much longer among planners.

Women with unplanned pregnancies reported more medical problems than women with planned pregnancies. Their chronic medical problems included hypertension, hypothyroidism, hyperthyroidism, diabetes, hepatitis and cardiac valvular disorders. There was, as expected, a significant association between parity and planning status; of women with planned pregnancies, 62% were primiparas as compared with 26% of women with unplanned pregnancies. Prior pregnancy loss was also more common among the planners; 37.7% of planners reported one or more prior losses, compared to 25.9% of women with an unplanned index pregnancy ($p < 0.01$). Furthermore, women with planned pregnancies reported more frequent prior infant deaths. There were 202 previous live births and 9 infant deaths reported by women with

planned pregnancies (4.5%), whereas planners reported 549 prior births and only 8 infant deaths (1.5%). This difference was statistically significant (Fisher exact test, $p = 0.02$). With respect to problems during the index pregnancy, significantly higher rates of vaginal and other infections were observed among women with unplanned pregnancies, and these women also took more medications during pregnancy. However, there were no differences by planning status in distribution of maternal prepregnant weight; mean weight gain by the 32nd week of pregnancy was 10.2 kg in both groups.

Table I also shows behavior during the index pregnancy. There was no significant difference in the frequency of smoking. Although there were similar proportions of women with planned and unplanned pregnancies that took any alcohol during pregnancy, planners tended to consume more drinks at any one time. Women with planned pregnancies (29.7%) were more likely to enroll for prenatal care within the first seven weeks of gestation compared with non-planners (14.1%), but there were no statistically significant differences in the number of prenatal visits between the two groups of women. (The mean number of visits was 8.5 for both planners and non-planners).

Despite some differences in the characteristics of the women, there were no statistically significant differences between planned and unplanned pregnancies in the rates of live

births, stillbirths, spontaneous abortion, low birth weight or preterm births (**Table II**). There was no significant difference in mean birth weight of the infant by maternal planning status (mean birth weight $3377 \pm 27.5\text{gm}$ for planners and $3328 \pm 26.3\text{gm}$ for unplanned), but as expected the mean birth weight was significantly reduced among infants of women who smoked during pregnancy ($3180 \pm 57.5\text{gm}$) as compared to non-smokers ($3372 \pm 29.0\text{gm}$). Female infants had a significantly lower mean birth weight than male infants ($3300 \pm 26.7\text{gm}$ and $3403 \pm 26.8\text{gm}$, respectively).

Table III shows the multivariate logistic analyses for each pregnancy outcome, after adjustment for potentially confounding variables listed in the footnote of the table. Adjusted odds of spontaneous abortion, low birth weight and preterm birth were unaffected by the planning status of the pregnancy.

We found the expected associations between several known risk factors for adverse pregnancy outcomes. For example, the odds of having a spontaneous abortion increased significantly with age (OR =1.08, CI 1.02-1.14). Prior low birth weight, prior preterm birth, and maternal hypertension in the index pregnancy were all associated with an increased risk of low birth weight and preterm birth. Smoking, low prepregnancy weight and female infants were associated with low birth weight (results not shown). This suggests that our data are not atypical.

Discussion

This prospective cohort study ascertained pregnancy intention at the time of conception. We interviewed the women when pregnancy was first recognized and the information was corroborated by independent review of the NFP charts. Thus, our data reflect a woman's intention at initiation of pregnancy. Marked differences between planners and nonplanners were observed with respect to age, maternal employment status, paternal occupation, parity, history of prior miscarriage and duration of NFP use. Women with unintended pregnancies were younger and older than those with planned pregnancies, which is consistent with reports of other investigators.²⁴⁻²⁷ Thus, women with unplanned pregnancies have a less optimal age distribution than the planners.

We hypothesized that women planning a pregnancy might be more likely to adopt better health care behaviors and, therefore, have better pregnancy outcomes than non-planners. Other investigators had previously reported that women with unintended pregnancy may initially attempt to deny or conceal their pregnancy, therefore presenting relatively later for prenatal care.^{13,14,28} In the present study, women with planned pregnancies were, indeed, more likely to seek early prenatal care but did not, on average, have more visits than women with unplanned pregnancies. A similar finding was reported by Cartwright.¹

Other risk behaviors were generally comparable among planners and nonplanners (Table I). Similar proportions of planners and nonplanners smoked or used alcohol during pregnancy, but planners were more likely to use alcohol daily and to take more drinks at any one time than the nonplanners, but the differences were small. It is noteworthy that a large proportion of the women in this study did not smoke (92.7%) and did not use alcohol (88.8%). Women with unplanned pregnancies had a higher rate of medication use during pregnancy, these women also reported more chronic medical problems and had higher rates of complications during pregnancy, including vaginal and other infections. Taken together, these observations support the idea of a lower risk profile among planners who manifested better health care behavior, eg. early initiation of prenatal care and fewer medical problems.

We also examined an alternative hypothesis that planners are possibly a self-selected group of women with poor reproductive histories who used NFP in order to improve their chances of successful conception. Women with planned pregnancies reported more frequent prior pregnancy losses and enrolled somewhat earlier in gestation than women with unplanned pregnancies (Table I). This might suggest that planners were seeking to improve their reproductive performance and used the NFP method for that reason. The fact that planners were more likely to be long term

users (two or more years) of the NFP method could imply that they had difficulty achieving conception. Also, a majority of the planners were having their first baby and were more likely to be currently working. This might suggest that they delayed pregnancy for social or occupational reasons.

The lower risk profile of the planners (eg. better health care and less frequent illness during the index pregnancy) may have been offset by a poorer obstetric history. Thus, despite differences in the characteristics of women with planned or unplanned pregnancies, the overall results showed no major differences in pregnancy outcomes. However, this study was of modest size and had limited power to detect differences between planned and unplanned pregnancies, particularly with respect to less common outcomes such as stillbirths or low birth weight.

Our findings are in agreement with other investigators who studied relatively homogeneous populations and who observed no evidence of an association between planning status and pregnancy outcomes.^{8,30} However, our findings are contrary to those of previous studies that reported an increased risk of outcomes such as low birth weight associated with unplanned pregnancies.^{1,8,9,30} These latter studies were largely retrospective investigations and may have been affected by recall problems. Also, they included disadvantaged populations that were already at higher

risk of adverse pregnancy outcomes. It must be noted that the present cohort of NFP users were highly motivated (as evidenced by the low loss to follow-up) and constitute a low risk population (as evidenced by low rates of low birth weight and prematurity, infrequent smoking and early use of antenatal care). Thus, our results, though applicable to NFP users should not be generalized to other more diverse populations.

In summary, our main finding was the lack of evidence for an association between unplanned pregnancies and adverse pregnancy outcomes. This finding was consistently demonstrated in each study center. We therefore conclude that there is no greater risk of spontaneous abortion, low birth weight and preterm birth among women who experience an unplanned pregnancy compared to women experiencing a planned pregnancy during NFP use.

TABLE I. Selected Characteristics of Women with Planned and Unplanned Pregnancies in the Multicenter Prospective Cohort Study of Pregnancy Outcomes, 1987-1991

Characteristic	Unplanned Pregnancy (Total = 373)		Planned Pregnancy (Total = 367)	
	N	%	N	%
SOCIODEMOGRAPHIC CHARACTERISTICS				
Maternal Age (years)***				
Less than 20	0	0	3	0.8
20-24	72	19.3	53	14.4
25-29	167	44.8	217	59.1
30-34	88	23.6	75	20.4
35-39	33	8.8	18	4.9
40-44	13	3.5	1	0.3
Study Center***				
Santiago, University of Chile	150	40.2	64	17.4
Santiago, Pontifica Catolica	138	37.0	87	23.7
Colombia, Javeriana	38	10.2	57	15.5
Washington D.C. NFP Providers	7	1.9	39	10.6
Milan, C.A.M.E.N.	40	10.7	120	32.7
Mother's Employment***				
Never employed	91	24.4	48	13.1
Employed in the past	129	34.6	84	22.9
Currently working	153	41.0	235	64.0
Father's Occupation				
Professional & Managerial	152	40.9	166	45.2
Sales and Clerical	119	32.0	116	31.6
Craftsmen/Transport equipment operators	42	11.3	30	8.1
Laborers	32	8.6	35	9.5
Other	27	7.3	20	5.4
Duration of NFP Use (years)***				
< 1	196	52.8	134	36.5
1-	89	23.9	100	27.2
2+	59	15.8	117	31.9
Missing	28	-	16	-
PAST MEDICAL/OBSTETRIC HISTORY				
Chronic Medical Problems***				
	108	29.0	62	16.9
Number of Previous Livebirths (Parity)***				
0	98	26.3	129	62.4
1	121	32.4	99	27.0
2	92	24.7	32	8.7
3 or more	62	16.6	7	1.9
Number of Prior Pregnancy Losses among 464 women with one or more previous pregnancies**				
0	214	74.0	109	62.3
1+	75	25.9	66	37.7

TABLE I. Selected Characteristics of Women with Planned and Unplanned Pregnancies in the Multicenter Prospective Cohort Study of Pregnancy Outcomes, 1987-1991

Characteristic	Unplanned Pregnancy (Total = 373)		Planned Pregnancy (Total = 367)	
	N	%	N	%
HISTORY OF INDEX PREGNANCY				
Medications***	130	34.9	75	20.5
Urinary Tract Infections	16	4.4	20	5.6
Vaginal Infections**	46	12.7	22	6.1
Other Infections*	58	16.2	35	9.8
Hypertension	4	1.2	5	1.5
Vaginal Bleeding	18	5.4	4	1.2
Sex of Infant: Male	174	52.3	160	49.5
Mother's Prepregnancy Weight (kg)				
Less than 50	75	20.4	86	23.6
50-59	191	51.9	175	48.1
60 or more	101	27.1	100	27.3
MATERNAL BEHAVIOR DURING PREGNANCY				
Smoking Cigarettes				
Non-smoking (Never/Stopped)	341	91.5	245	94.0
Currently smoking	32	8.6	22	6.0
Maximum Number of Drinks at one time while pregnant*				
None	332	89.0	325	88.6
Less than 1 drink	29	7.8	15	4.1
1 drink	11	3.0	21	5.7
2 or more drinks	1	0.3	6	1.6
Gestational Age at First Prenatal Visit (weeks) *** #				
2-7	47	14.1	96	29.7
8-11	182	54.7	141	43.7
12+	104	31.2	86	26.6
Number of Prenatal Visits #				
4 or more	306	91.9	301	93.2
Less than 4	27	8.1	22	6.8

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

**TABLE II. Pregnancy Outcomes for Women with Planned and Unplanned
Pregnancies in the Multicenter Prospective Cohort Study of
Pregnancy Outcomes, 1987-1991**

Pregnancy Outcome	Unplanned Pregnancy		Planned Pregnancy	
	N	%	N	%
All Pregnancies	373	100.0	367	100.0
Spontaneous abortion	37	9.9	40	10.9
Stillbirth	3	0.8	4	1.1
Live birth	333	89.3	323	88.0
 All live births	 333	 100.0	 323	 100.0
Low birth weight	10	3.0	14	4.3
Preterm birth	25	7.5	19	5.9
Low birth weight and preterm	6	1.9	7	2.1

TABLE III. Multivariate Adjusted Risk of Adverse Pregnancy Outcomes Associated with Planning Status in the Multicenter Prospective Cohort Study of Pregnancy Outcomes, 1987-1991

Pregnancy Outcome	Crude Odds Ratio (95% Confidence Interval)	Adjusted Odds Ratio (95% Confidence Interval)
Spontaneous Abortion		
Planned pregnancy/ Unplanned pregnancy	0.90 (0.55,1.43)	0.80 (0.43-1.51)
Low birth weight		
Planned pregnancy/ Unplanned pregnancy	0.69 (0.30,1.58)	0.90 (0.24-3.44)
Preterm birth		
Planned pregnancy/ Unplanned pregnancy	1.30 (0.70,2.41)	0.57 (0.23-1.43)

* Adjusted for maternal age, birth order, prior low birth weight or preterm delivery, hypertension or vaginal bleeding in index pregnancy, smoking, prepregnancy weight, sex of infant and center.

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